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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF

MINORU KOTATO, ET AL.

SERIAL NO: 09/926,779

FILED: MAY 28, 2002

FOR: NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY

: EXAMINER: L.S. WEINER

: GROUP ART UNIT: 1745

DECLARATION UNDER 37 C.F.R. § 1.132

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VA 22313-1450

SIR:

Now comes Minoru Kotato who deposes and states that:

1. I am one of the joint inventors of the above-identified application.
2. I graduated from Faculty of Science, Hokkaido University, Graduate School of Science, Department of Chemistry, in 1992, and have been employed by Mitsubishi Chemical Corporation from 1992 to 2003, and have been employed by Mitsubishi Chemical Group Science and Technology Research Center, Inc. since 2003 as a Researcher. I have been engaged in the research and development of lithium ion secondary batteries for more than 7 years.
3. The following experiments were completed by me or under my supervision and control.

Batteries were prepared in the same manner as in Example 1 of the above-identified application, except that the content of vinyl ethylene carbonate (VEC) was 5% by weight, 10% by weight, 50% by weight or 100% by weight, respectively (5% by weight of VEC

corresponds to Example 1 of the above-identified application). The remainder of the electrolyte <sup>solvent</sup> was propylene carbonate, i.e., in the batteries where the amount of VEC was less than 100% by weight.

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In addition, a battery was prepared in the same manner as in Example 1 of the above-identified application, except that the solvent composition in Example 1 of JP4-87156 was used, i.e., an equal volume of VEC and 1,2-dimethoxyethane (DME). In this electrolyte, lithium hexafluorophosphate ( $\text{LiPF}_6$ ) was used instead of the lithium trifluoromethanesulfonate described in Example 1 of JP4-87156.

The batteries were subjected to testing in the same manner as in the Examples of the above-identified application.

In the case that the content of vinylethylene carbonate (VEC) is 5% by weight, 10% by weight, 50% by weight or 100% by weight, respectively, and a mixed solvent containing VEC and DME with an equivalent volume is used, capacity-potential curves involved in charge-discharge at the first cycle are shown in Figs. A, B, C, D and E, respectively, attached hereto.

In case that the content of vinylethylene carbonate (VEC) is 5% by weight, 10% by weight, 50% by weight or 100% by weight, respectively, and a mixed solvent containing VEC and DME with an equivalent volume is used, dedoped capacity and efficiency at the first cycle are shown in Table A below.

As storage property, in case that the content of vinylethylene carbonate (VEC) is 5% by weight, 10% by weight, 50% by weight or 100% by weight, respectively, and a mixed solvent containing VEC and DME with an equivalent volume is used, the percentage of dedoped capacity <sup>dedoped capacity</sup> volume after storage to ~~volume~~ before storage is shown in Table B below.

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Table A

|             | Dedoped capacity at 1 <sup>st</sup> cycle (mAh/g) | Efficiency at 1 <sup>st</sup> cycle (%) |
|-------------|---|---|
| 5 wt% VEC   | 329   | 91.9                                    |
| 10 wt% VEC  | 321   | 91.7                                    |
| 50 wt% VEC  | -   | -                                       |
| 100 wt% VEC | -   | -                                       |
| VEC:DME=1:1 | 208   | 88.0                                    |

Table B

|             | Storage properties (%) |
|-------------|------------------------|
| 5 wt% VEC   | 97.4                   |
| 10 wt% VEC  | 95.0                   |
| VEC:DME=1:1 | 80.1                   |

The experiment in which the content of vinylethylene carbonate is 5% by weight is identical to Example 1 of the above-identified application, and each of obtained values in the experiment is also approximately the same in Example 1 of the above-identified application. This shows that these experiments are well-replicated.

As shown in Figs. C and D, when the content of vinylethylene carbonate (VEC) is 50% by weight or 100% by weight, respectively, a flat portion was observed in the vicinity of 1.4 V, and degradation of vinylethylene carbonate proceeded, and it was impossible to dope by 0 V.

4. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

5. Further deponent saith not.

Minoru Kotato  
Minoru Kotato

11/12/2004  
Date